Trend Study 22-5-03

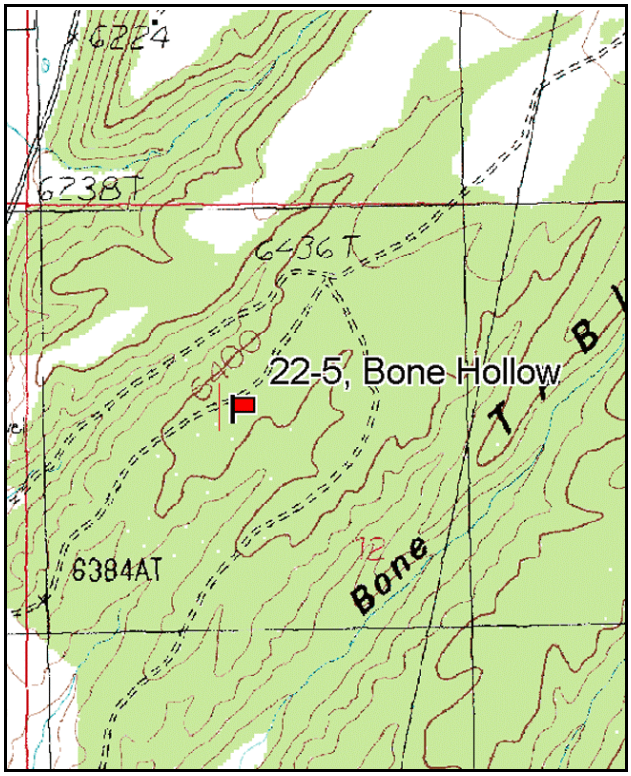
Study site name: Bone Hollow . Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 165 degrees magnetic. Lines 2-4 208° M.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

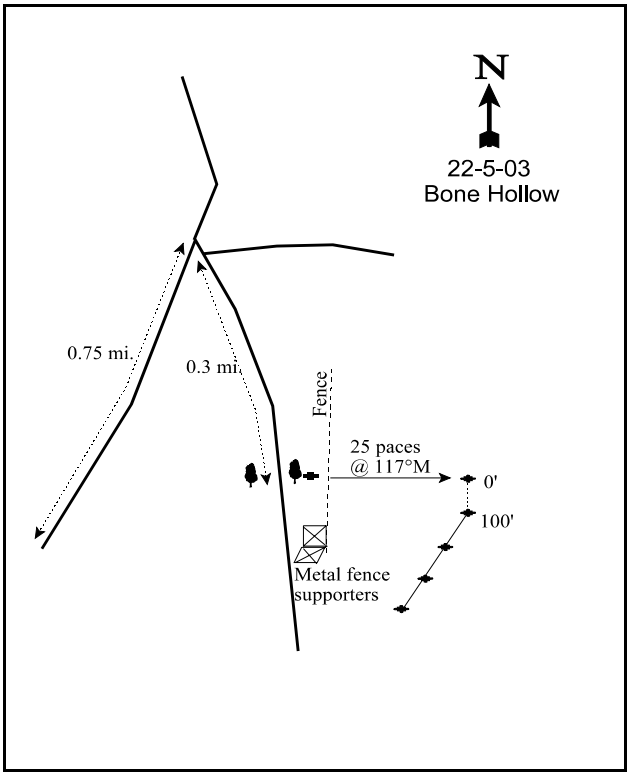
LOCATION DESCRIPTION

From the intersection of North Creek Road and SR 153 on the east side of Beaver, go north 1.95 miles past an irrigation pond on the left to a gravel pit on the right. On the south side of the gravel pit a good dirt road goes northeast up the bottom of a draw (ignore the numerous other small dirt roads). Drive up this road 0.75 miles to a fork. Turn right onto another major dirt road and go south 0.3 miles. Look for a fencepost 50 feet to the left that is not part of the fence (30 feet north of metal crossposts). The fencepost marks the start of a pellet group transect. Walk 25 paces at 117 degrees magnetic from the witness post to the 0' stake marked by a 3-foot rebar tagged #7048.



Map Name: Beaver

Township 29S , Range 7W , Section 12



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4240485 N, 360446 E

DISCUSSION

Bone Hollow - Trend Study No. 22-5

The Bone Hollow trend study samples an area of Wyoming big sagebrush and juniper on land administered by the BLM. The transect is located on a slight south facing slope at an elevation of 6,400 feet. This site is typical of the untreated winter ranges on the benches above Beaver, which have been historically important deer winter range. Deer use is moderate to heavy and varies somewhat from year to year depending on the severity of the winter. A pellet group transect read on the site in 1998 and 2003 estimated 93 deer days use/acre (230 ddu/ha) and 132 deer days use/acre (326 ddu/ha) respectively. In 2003, about one-half of the deer pellet groups appeared to be from the winter, while the other half were more recent and likely from early spring. A few old, weathered cattle pats were also noticed on the site.

Soils are moderately deep, fairly compacted, and very stony throughout. Effective rooting depth was estimated at just over 12 inches in 1998 with a low average soil temperature of 49°F at almost 15 inches in depth. Soil temperature averaged 71°F in 2003 indicating a much drier soil profile compared to 1998. Soil textural analysis indicates a sandy clay loam with a neutral pH (6.7). Plant development may be limited due to relatively low amounts of phosphorous (8.5 ppm). Past erosion is apparent with a high percentage of pavement and rock cover on the soil surface. Litter and herbaceous vegetation are found mostly under sagebrush plants. Erosion was minimal in 2003 and soils were rated as stable from an erosion condition class assessment.

A fairly dense and uniform stand of Wyoming big sagebrush, along with an open woodland of juniper and pinyon, gives this extensive area it's vegetative aspect. Wyoming big sagebrush is the only desirable browse species that is abundant enough to be considered important. Sagebrush density was estimated at 4,680 plants/acre in 1998, declining to 3,920 in 2003. Browsing pressure has been moderate to heavy in all readings, although vigor has been generally good. Reproduction has been low since 1991, with young plants making up less than 5% of the total population. Percent decadence was moderate but stable from 1985 to 1998 (30-35%), but increased to 46% in 2003. In 2003, 25% of the decadent age class was classified as dying and with no young plants being sampled, sagebrush could show further declines in the future. Seed production appeared low in both 1991 and 1998, but was noted as good in 2003. Annual sagebrush leaders averaged 1.6 inches of growth by June 2003. Drought and the abundance of pinyon-juniper on the site are likely playing a role in declining sagebrush health. Point-center quarter data collected in 2003 estimated 63 pinyon trees/acre and 196 Utah juniper trees/acre. Total canopy cover of pinyon and juniper was estimated at almost 18% in 2003. Pinyon and juniper trees have some value as thermal cover, and many have been highlined. This site would be a good candidate for mechanical treatment to reduce tree density. A reduction in pinyon-juniper tree density would decrease competition between trees and sagebrush/herbaceous understory species. Other browse species scattered throughout the site in low abundance are increasers including broom snakeweed, narrowleaf low rabbitbrush, and prickly pear cactus.

A variety of grass species are found on the site, although most occur in low abundance. Cheatgrass was the dominant grass in 1998 as it provided 79% of the herbaceous understory cover and 40% of the total vegetative cover on the site. Cheatgrass was encountered in every quadrat in 1998, with a nested frequency value of 379 out of a possible 400. In 2003, with drier conditions, cheatgrass significantly declined in nested frequency and was sampled in only 69 of the 100 quadrats. Cheatgrass cover dropped by 86% in 2003 as well. Several valuable perennial grasses have been sampled on the site but all occur in low densities including bottlebrush squirreltail, Indian ricegrass, Sandberg bluegrass, and bluebunch wheatgrass. These species are remaining stable, but an increase is not likely with the abundance of cheatgrass, drought, and the high density of pinyon-juniper trees on the site. Forbs occur sporadically throughout the community. Composition is composed of annuals and/or small statured species that contribute little forage in the spring. Sum of nested frequency for perennial forbs was fairly stable from 1985-1998, but declined in 2003.

1985 APPARENT TREND ASSESSMENT

The soil trend may be slightly downward with erosion occurring in the openings and slow soil building under browse plants. The vegetative composition and age structure indicate a stable Wyoming sagebrush/grass community with slow pinyon-juniper encroachment. Cool season herbaceous species are conspicuously absent as a result of constant heavy livestock spring grazing in the past. A chaining could be used to help restore the area to a more productive state, but the rockiness of the surface soil would limit the success of broadcast seeding unless the soil is sufficiently disturbed.

1991 TREND ASSESSMENT

The soil trend is still considered slightly downward. Vegetative basal cover is still low at 4%. Rock-pavement cover has decreased, with percent bare ground rising to 19% and percent litter cover decreasing to 40%. There is only one key browse species, Wyoming big sagebrush, which has a 4% increase in it's population density. Biotic potential (seedlings) and the number of young plants have decreased, while percent decadence remains high but stable at 33%. The percentage of plants classified as having poor vigor has more than doubled to 18%. The browse trend is slightly downward with the decline of the young and seedling sagebrush as well as increased poor vigor. The trend for the herbaceous understory is stable although sum of nested frequency has slightly declined with drought.

TREND ASSESSMENT
soil - slightly down (2)
browse - slightly down (2)
herbaceous understory - stable (3)

1998 TREND ASSESSMENT

The soil trend is stable. There does not appear to be accelerated erosion on the site at this time. Percent bare ground cover has declined since 1991, as well as combined percent rock and pavement cover. Percent litter cover has increased to 48%, although much of the litter is comprised of fine fuels contributed by cheatgrass. The browse trend is slightly downward. Percent decadence in the big sagebrush population has increased since 1991. Although the percentage of dying plants has decreased, there are still many dying plants encountered with few seedling or young plants being encountered in 1998. Sagebrush density also decreased. The herbaceous understory trend is stable with little change in perennial herbaceous understory sum of nested frequency. Cheatgrass is dominate and could carry a catastrophic fire where all the browse would be lost.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down (2)
herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable. Ground cover characteristics are similar to 1998 estimates, especially for the key parameters. Litter cover declined in 2003, but most of this was due to the decline in cheatgrass cover which went from 20% to 3%. Erosion remains minimal and soils are stable at the present time. Trend for browse is down. Several key parameters in the Wyoming big sagebrush population showed negative changes in 2003 including a decline in density, no recruitment, and increases in heavy use and percent decadence. Additionally, 25% of the decadent sagebrush were classified as dying in 2003. Trend for the herbaceous understory is stable. Perennial grasses have a stable sum of nested frequency value while they have increased in cover. Perennial forbs declined in sum of nested frequency in 2003, but are less significant than grasses on

this site. Another positive change in the understory is the significant decline in cheatgrass frequency and cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 5

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron intermedium	-	-	-	1	-	.00
G	Agropyron spicatum	1	3	1	-	.03	.00
G	Bouteloua gracilis	ab1	a-	ab12	b12	.12	.39
G	Bromus tectorum (a)	-	-	b379	a186	20.28	2.75
G	Oryzopsis hymenoides	50	35	34	33	1.51	1.95
G	Poa secunda	a-	b11	ab2	b10	.00	.05
G	Sitanion hystrix	b122	ab99	ab103	a91	2.21	2.35
G	Stipa comata	9	12	11	13	.64	.26
G	Vulpia octoflora (a)	-	-	-	1	-	.00
Total for Annual Grasses		0	0	379	187	20.28	2.76
Total for Perennial Grasses		183	160	163	160	4.52	5.01
Total for Grasses		183	160	542	347	24.80	7.77
F	Agoseris glauca	a5	a5	b17	a-	.11	-
F	Alyssum alyssoides (a)	-	-	9	-	.01	-
F	Antennaria rosea	-	3	4	-	.01	-
F	Arabis demissa	1	1	5	5	.04	.01
F	Astragalus spp.	a-	ab4	b17	a-	.10	-
F	Camelina microcarpa (a)	-	-	-	3	-	.03
F	Chaenactis douglasii	a7	b20	a5	a-	.01	-
F	Collinsia parviflora (a)	-	-	-	7	-	.01
F	Cryptantha spp.	b10	b20	a-	b9	-	.11
F	Descurainia pinnata (a)	-	-	3	8	.00	.02
F	Draba spp. (a)	-	-	-	9	-	.01
F	Erigeron pumilus	b10	a-	a3	a-	.00	-
F	Gayophytum ramosissimum(a)	-	-	-	7	-	.01
F	Gilia spp. (a)	-	-	a-	b136	-	1.27
F	Holosteum umbellatum (a)	-	-	-	1	-	.00
F	Lappula occidentalis (a)	-	-	-	6	-	.03

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Leucelene ericoides	-	7	5	11	.03	.02
F	Machaeranthera canescens	$_{b}$11	$_{a}$2	$_{a}$-	$_{a}$-	-	-
F	Microsteris gracilis (a)	-	-	1	5	.00	.01
F	Phlox austromontana	$_{ab}$17	$_{a}$9	$_{b}$27	$_{a}$5	.23	.04
F	Ranunculus testiculatus (a)	-	-	$_{a}$33	$_{b}$77	.16	.84
F	Schoencrambe linifolia	-	-	-	3	-	.00
F	Sphaeralcea coccinea	5	14	16	18	.22	.13
Total for Annual Forbs		0	0	46	259	0.18	2.26
Total for Perennial Forbs		66	85	99	51	0.79	0.31
Total for Forbs		66	85	145	310	0.97	2.58

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 22 , Study no: 5

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Amelanchier utahensis	0	0	.00	-
B	Artemisia tridentata wyomingensis	87	88	17.43	15.22
B	Atriplex canescens	0	0	-	.15
B	Chrysothamnus nauseosus	1	0	.03	-
B	Chrysothamnus parryi	0	1	-	-
B	Chrysothamnus viscidiflorus stenophyllus	0	0	-	-
B	Gutierrezia sarothrae	4	1	.06	-
B	Juniperus osteosperma	11	14	4.32	7.50
B	Mahonia repens	0	1	-	-
B	Opuntia spp.	4	3	.03	.15
B	Pinus edulis	2	7	2.65	4.05
B	Sclerocactus	1	0	-	-
Total for Browse		110	115	24.54	27.07

CANOPY COVER, LINE INTERCEPT --
Management unit 22 , Study no: 5

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	11.89
Juniperus osteosperma	9.39	12.43
Opuntia spp.	-	.16
Pinus edulis	2.00	5.19

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 22 , Study no: 5

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.6

POINT-QUARTER TREE DATA --
Management unit 22 , Study no: 5

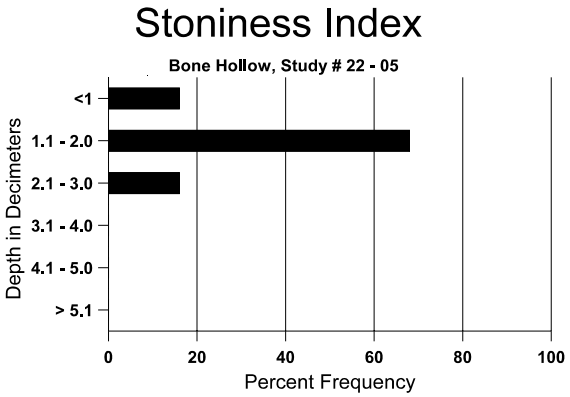
Species	Trees per Acre		Average diameter (in)	
	'98	'03	'98	'03
Juniperus osteosperma	149	196	4.5	3.4
Pinus edulis	39	63	3.3	2.8

BASIC COVER --
Management unit 22 , Study no: 5

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	3.75	3.75	41.04	35.17
Rock	1.75	2.25	6.06	3.44
Pavement	42.75	35.25	27.36	31.30
Litter	43.00	39.75	48.47	34.86
Cryptogams	0	.50	.26	.07
Bare Ground	8.75	18.50	14.31	12.32

SOIL ANALYSIS DATA --
Management unit 22, Study no: 5, Study Name: Bone Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.4	70.6 (11.9)	6.7	52.4	23.1	24.6	2.6	8.5	96.0	0.7



PELLET GROUP DATA --
Management unit 22 , Study no: 5

Type	Quadrat Frequency '98	Quadrat Frequency '03	Days use per acre (ha) '98	Days use per acre (ha) '03
Rabbit	34	4	-	-
Deer	66	27	93 (230)	132 (326)
Cattle	1	-	-	-

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 5

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
85	**5865**	1133	1266	2866	1733	-	44	16	30	8	15/15
91	**6133**	-	333	3800	2000	-	45	14	33	18	13/24
98	**4680**	80	200	2860	1620	680	59	18	35	8	17/27
03	**3920**	-	-	2100	1820	580	32	37	46	12	19/27
Chrysothamnus nauseosus											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**20**	-	-	20	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	-/-
Chrysothamnus parryi											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**20**	-	-	20	-	-	0	0	-	0	6/6

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus stenophyllus											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**66**	-	66	-	-	-	100	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	-/-
Gutierrezia sarothrae											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**133**	-	133	-	-	-	0	0	-	0	-/-
98	**100**	80	-	100	-	-	0	0	-	0	7/9
03	**20**	-	20	-	-	-	0	0	-	0	8/8
Juniperus osteosperma											
85	**66**	-	66	-	-	-	0	0	-	0	-/-
91	**66**	133	66	-	-	-	0	0	-	0	-/-
98	**240**	180	160	80	-	-	0	0	-	0	-/-
03	**280**	20	160	120	-	-	0	0	-	0	-/-
Mahonia repens											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**20**	-	-	20	-	-	0	0	-	0	-/-
Opuntia spp.											
85	**66**	66	66	-	-	-	0	0	-	0	-/-
91	**466**	-	200	266	-	-	0	0	-	0	5/6
98	**80**	-	-	80	-	-	0	0	-	0	5/10
03	**60**	-	-	60	-	-	0	0	-	0	4/9
Pinus edulis											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**40**	-	40	-	-	-	0	0	-	0	-/-
03	**140**	-	120	20	-	-	0	0	-	0	-/-
Sclerocactus											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**20**	-	-	20	-	-	0	0	-	0	2/4
03	**0**	-	-	-	-	-	0	0	-	0	-/-